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SURVEYS AND RECONNOISSANCES FROM 1870
TO 1875 FOR A SHIP CANAL ACROSS
THE AMERICAN ISTHMUS.

BY COMMODORE DANIEL AMMEN, U. S. NAVY.

WASHINGTON, D. C., *October 21, 1876.*

Chief Justice DALY, LL. D., *President American Geographical Society, N. Y.*

DEAR SIR.—In reply to the request of the Society for information in regard to the recent surveys which have been executed by the government of the United States for a transcontinental ship canal across the American isthmus, I very cheerfully send you the enclosed communication, placing it at the disposal of the Society. In presenting the paper relating to these surveys, a brief explanation may, however, be expected from me by at least some of your members.

More than twenty years ago I was attracted to the consideration of this subject by the then published accounts of the coincident attempts by the English, the French and ourselves, in the vicinity of Caledonia bay, to discover the pretended Cullen route—a route disproved by those three parties, but which, having been again insisted upon as feasible, was recently shown by the American expedition (1870) to be a physical impossibility, by reason of the elevation of the water-shed adjacent to and across the “divide” near Caledonia bay, the chief streams of which water-shed flow into the Pacific.

At the date referred to, the English, working from the Savanna river, ran a line of levels toward Caledonia bay, and reached the waters of the Sucubti, the stream north and west of the Caledonia bay range of mountains, at a height sufficient to show the impracticability of the route.

The French seem to have abandoned their work without producing instrumental results indicating in any degree a hope of success.

The American party, under Lieut. Strain of the navy, ascended the mountain range from the bay, reached the Sucubti on the Pacific slope, and, without the use of instruments of precision,

followed the tortuous stream to the Chucunaque, and made their way down that still more tortuous stream, with the loss of more than half of their number by starvation. This was the natural result of not providing proper outfit, and carefully husbanding their provisions. No positive knowledge was gained by our expedition, except the necessity that future explorers should be judiciously provisioned and equipped with the means of securing the best instrumental results.

After two days' descent of the Sucubti, Strain's party when encamped upon an island, had supposed they heard the evening gun of the "Cyane," the vessel which they had left anchored in Caledonia bay. This supposed fact, seemingly without significance to them, attracted my attention; for, if it were a fact, it would appear to indicate the existence of a low line of levels between that point and the waters of Caledonia bay. It seemed to me not at all likely that the sound was deflected up a mountain side and again descended through the valley beyond.

I was led to consider more fully the probability of a low line of levels near the point referred to, and further to study the question of meeting the formidable obstacles besetting explorers in this almost impassable region, and of securing sufficiently positive conclusive knowledge of the country to establish, in relation to all the water-sheds, the practicability of a transcontinental ship canal, or the reverse.

Presenting my views, in 1856, to Mr. Toucey, then secretary of the navy, but failing to receive his countenance and support, I went to the Pacific ocean on board of one of our vessels of war, and did not return until 1860, when I wrote out briefly my project for exploring the entire region necessary to be examined, in a paper which this Society did me the honor to read on the seventh of June of that year. This project has, in fact, formed the basis of our surveys and explorations, modified as has been found necessary by the intelligent and able officers who have actually executed the work.

At the time when the paper was read to your Society, the political condition of our country was disturbed, and the years of civil war which followed, indefinitely postponed even the consideration of this most important object. On my return from the Asiatic station in April, 1869, I was gratified at finding that appropriations had been made for transcontinental ship-canal surveys, and that General Grant, then president, was initiating a comprehensive examination and sufficient surveys of the extensive region involved. Their full

execution has required years of labor, and the employment of large well-equipped parties, as will be hereafter shown.

For the past five years, during which I have been chief of the Bureau of Navigation, the Secretary of the Navy has honored me by directing the Bureau to give special attention to the selection of most efficient officers for this work; to look closely to the proper supply of articles of subsistence, and of the best instruments found by experience to be suitable; to formulate orders for his examination and approval; to examine closely the results of surveys; and to supply whatever deficiencies might be found to exist for the full investigation and determination of this question.

Since the appointment by the President of the commission to investigate and report upon a transcontinental ship-canal route,* all orders and instructions for surveys in progress have been, in effect, in accordance with the wishes and requirements of that commission; at their instance a close instrumental survey and actual location of a route was made on the Isthmus of Panama, and a further examination of the Chepo-San Blas route from the Pacific coast.

The surveys were at length completed, as will be referred to in detail. They were satisfactory to the commission, and I can assure you that their execution was no holiday work. In every case where tentative lines only were prosecuted, this was done instrumentally to a point developing impracticability, or else a manifest inferiority for construction, as compared with other lines found more favorable. On the latter actual instrumental locations for a canal were made, and plans and approximate estimates of construction prepared.

I cite, in this connection, a few paragraphs from my report to the Secretary of the Navy, of October 26, 1875 (Annual Report of Secretary of the Navy for the year 1875, pages 60, 61.):

“The arduous work which has been carefully prosecuted for five seasons by two or more parties from the Isthmus of Tehuantepec to twenty or more miles south of the mouth of the Napipi, on the River Atrato, is at length satisfactorily accomplished.

“It is the duty of this Bureau to acknowledge the ability and energy of the different officers who have been in command, and the untiring zeal and faithful and intelligent exertions of their subordi-

* The commission appointed March 13, 1872, was ordered to consist of the chief of engineers U. S. A., the superintendent of the coast survey, and the chief of the bureau of navigation.

nates. The precautions of those in command are shown in the fact that not one officer or man has succumbed to climatic influences, though many doubtless carried the seeds of disease and earlier death away from the field of operations. No case of bad conduct in either officer or man engaged on this work has come to the knowledge of the Bureau." * * *

"By tentative surveys, following in the main up the various valleys on both coasts, until reaching heights and distances apart that would make the different water-sheds between the points named inferior to other points already known, the process of elimination was completed. It was a long, laborious process, taxing the endurance of the officers and men.

"Since my last report, at the request of the commission appointed to consider and report upon the interoceanic canal, by your order, a careful survey of the Isthmus of Panama was made, the computations completed, and the whole placed before the commission.

"A reconnoissance on the west coast was also made of the Rio Chepo and the San Blas route, where the tide-waters of the two oceans approach more nearly than at any other point. This work was executed by Commander E. P. Lull, U. S. N., and junior naval officers, aided by Civil Engineer A. G. Menocal, U. S. N.

"At the instance of Commander T. O. Selfridge, who had executed the former work on what is known as the Napipi route, the Department directed the fitting out of another expedition to make an actual location of an interoceanic canal along this line.

"This work was assigned to Lieut. F. Collins and junior naval officers.

"The work has been successfully accomplished, the computations made and placed before the commission.

"So careful and minute has been the examination of the different water-sheds up to the point of manifest inferiority to other known points, that no doubt now exists as to the approximate labor necessary in the construction of an interoceanic ship-canal at several points. It is proper to add, that the most careful and elaborate surveys would necessarily have to be made in advance at any point heretofore examined before commencing the construction of an interoceanic ship-canal, and that these surveys could only ameliorate the labor and cost of construction, inasmuch as *the locations, as given, are actual throughout their length*, and would only be changed when an advantage would be gained by doing so."

In view of these conclusions, which I hope to establish fully with

those who will re-examine the various surveys that will be hereafter summarized, I have read with some surprise the postulates recently and widely published by M. Leon Drouillet, engineer, and member of a "commission of commercial geography of Paris," lately formed under the sanction of the French Société de Géographie—postulates on this subject thus seemingly indorsed by that learned and distinguished body.

Through the kindness of M. Drouillet, I have been favored with a copy of the proceedings of the "French Section of the International Committee for the Exploration of the American Isthmus," and also with a pamphlet, of which this gentleman is the author, elaborating a plan for such an international exploration.*

In the pamphlet referred to, M. Drouillet, when urging the necessity of an international exploration of the American isthmus, sets out with the following postulates :

"Le problème de la Navigation inter-Océanique est actuellement insoluble par suite de l'insuffisance des données géographiques et des contradictions flagrantes qui existent dans ces données; insuffisance et contradictions qui ne permettent point à l'ingénieur l'étude approfondie d'un projet définitif."

["The problem of interoceanic navigation is, at present, incapable of solution on account of the insufficiency of geographical data, and of the flagrant contradictions which exist in these data—an insufficiency and contradictions which do not permit the engineer to study profoundly a definite project."]

On the strength of these assertions, with the seeming approval of the Geographical Society of Paris, an appeal is made to the learned societies of the world, and to all the powers interested, to lend their aid to a "general and serious exploration of the isthmus."

In view, therefore, of the long series of elaborate explorations and reconnoissances lately made by the United States, reported upon by the commission to the president, and *accepted as satisfactory by him* it seems proper to present what has been really done by us, and to

* "Société de Géographie et Commission de Géographie Commerciale de Paris, Section Française du Comité International d'étude pour l'exploration de l'Isthme Américain en vue du percement d'un Canal inter-Océanique.

"Procès verbal de la séance du 11 Mai, 1876."

"Les Isthmes Américains—Projet d'une exploration Géographique Internationale des terrains qui semblent présenter le plus de facilités pour le Percement d'un Canal Maritime inter-Océanique. Par. M. Léon Drouillet, Ingénieur, Membre de la Société de Géographie et de la Commission de Géographie Commerciale de Paris."

leave to the good judgment of those societies and interested powers, whatever action seems to them necessary or advisable.

The demand for a resurvey is rested upon two principal grounds :

1st. That the data at hand are insufficient.

2. That what information is available is flagrantly contradictory.

Let us consider these two assertions separately.

As for the sufficiency of the data at hand, without, at present, going beyond the work executed for the most part during the past six years by the United States alone, we may point to the following not inconsiderable sources of reliable information respecting every part of the isthmus, of any promise for a canal, from Tehuantepec to the Napipi river in South America.

Of our survey and reconnoissances the following is a list in the geographical order from the north and west to the south and east, in regard to which list it is to be specially noted that every survey and reconnoissance was made with instruments of precision, unless mention to the contrary is herein made.

All lines upon which calculations have been founded were run by compass and chain, or transit and chain, or by gradiometer and stadia-rod, the barometer being relied upon only to fill in the topography on either side of the main line.

1. Instrumental reconnoissance of the Isthmus of Tehuantepec, by Captain R. W. Shufeldt, U. S. N., 1872.

2. Examination, survey, and definite instrumental location of interoceanic canal route from the vicinity of Greytown, *via* Lake Nicaragua, and thence *via* the Rios del Medio and Grande to Brito, by Commander E. P. Lull, U. S. N., 1872, 1873, with some preliminary operations by Commander Chester Hatfield, U. S. N., in 1872.

3. Examination, survey and definite instrumental location of an interoceanic canal route from Navy bay to Panama, by Commander E. P. Lull, U. S. N., 1875.

4. Examination and surveys from the Gulf of San Blas towards the River Chepo, by Commander T. O. Selfridge, U. S. N., 1870 ; and Reconnoissance from the waters of the Chepo towards the Gulf of San Blas, by Commander E. P. Lull, U. S. N., 1875.

5. Several tentative instrumental lines in the vicinity of Caledonia bay, across the Cordilleras to the waters of Sucubti and Morti rivers, tributaries to the Chucunaque, by parties under the direction of Commander T. O. Selfridge, U. S. N., 1871.

6. A barometrical reconnoissance of the so-called "De Puydt

route," by way of the Tanela river between the Tuyra and the Atrato, by a party under the direction of Commander T. O. Selfridge, U. S. N., 1871.

7. Tentative instrumental lines by the so-called "Gogorza route," from the eastern coast *via* the Atrato, Cacarica and Paranchita rivers, and from the west coasts, *via* the Tuyra and Cué rivers across the "divide," by parties under the direction of Commander T. O. Selfridge, U. S. N., 1871.

8. An instrumental examination of what is known as the "Truando route," by Lieuts. Michler, U. S. A., and Craven, U. S. N., 1856-57.

9. An instrumental reconnoissance of the Napipi and Cuia rivers, including a reconnoissance of the Atrato river to the town of Quibdó, by parties under the direction of Commander T. O. Selfridge, U. S. N., 1871 and 1873.

10. Tentative examinations and definite instrumental location of an interoceanic canal route by way of the Napipi and Dogundo rivers, by Lieut. Frederick Collins, U. S. N., 1875.

The results of these several explorations will now be briefly noted in the same order:

1. *Tehuantepec*.—*Indisputably inferior to other known points.* Number of locks required, 140. Length of canalization, 144 miles.

2. *Nicaragua*.—A summit of 107.6 feet; length of canal requiring excavation, 61.75 English miles; slack-water navigation by means of dams in the bed of the San Juan river, from the mouth of the San Carlos to Lake Nicaragua, a distance of sixty-three miles. Lake navigation for 56.5 miles to Virgin bay; and thence, *via* the valleys of the Rio del Medio and Rio Grande to Brito.

This plan involves the construction of four dams having an average height of 29.5 feet, and an aggregate length of one thousand three hundred and twenty (1,320) yards; and of twenty locks of an average lift of ten and twenty-eight hundreds (10.28) feet each. It also involves the construction of two harbors of sufficient extent to insure, at least, a smooth and safe entrance into and exit from the canal.

It is worth remarking that M. Drouillet, in presenting the fifteen projects in this vicinity, does not distinctly describe this route (projected after a careful instrumental survey, involving several tentative lines from Lake Nicaragua to the Pacific); nor would a reader of the pamphlet referred to, assign this line as above presented, to any one of the fifteen projects given in it. This leads to the

supposition that he has given the preference to some of the less exact surveys or supposititious pretensions quoted as examined; and this belief is entirely verified by the fact that he gives the actual height of Lake Nicaragua above the sea level as thirty-seven metres, which is thirteen and six tenths (13.6) English feet in excess of the true elevation (as presented by our careful instrumental surveys)—in excess even of the elevation to which the mean elevation of the surface of the lake is to be raised and maintained by a dam.

3. *Panama*.—This survey, executed as has been said, at the request of the commission appointed by the president to investigate the whole question of a ship canal, made an actual location along an entire route. Maps, plans and estimates for excavation and construction have been carefully prepared, as upon the Nicaragua route, and on a common basis of cost for like labor. The report of the survey published in the appendix to the report of the secretary of the navy for 1875, does not appear to have been in M. Drouillet's possession.

4. *San Blas*.—The surveys of Commander Selfridge from the east coast, and those of Commander Lull, from the western, demonstrated that there is no practicable route between the Gulf of San Blas and the waters of the Chepo, even with a tunnel of eight (8) miles, although between these points the tides approach each other from the two oceans more nearly than elsewhere.

5. *Caledonia Bay*.—The tentative instrumental lines from the northern and southern parts of Caledonia bay across the "*divide*" to the elevated beds of the Morti and Sucubti rivers, showed, for the second time, that the information of Edward Cullen was an invention.

The line from the southern extremity of Caledonia bay crossed the "*divide*" at an elevation of twelve hundred and fifty-nine (1,259) feet, and struck the bed of the Sucubti at a height of five hundred and fifty-three (553) feet, thus precluding the possibility of any pass under that altitude above the point reached on the Sucubti.

The line from the northern extremity of the bay up the valley of the Sassardi and across the "*divide*" to the Morti, crossed at an altitude of eleven hundred and forty-eight (1,148) feet, and no indications of any pass under one thousand (1,000) feet could be discovered.

This line is marked by M. Drouillet for re-examination.

6. *De Puydt's Route*.—The exact line advocated by De Puydt, as

obtained from a gentleman who had accompanied him, was followed for some thirty-three (33) miles. At this distance an elevation of six hundred and thirty-eight (638) feet had been reached, while the mountains of the divide were plainly visible beyond. Three mercurial mountain barometers were used; one at the sea level was observed at short intervals during the whole reconnoissance, the other two were carried by the party; bench marks were established at convenient distances, one barometer remaining at each bench until another had reached the next, and until sets of different observations had been obtained.

7. *The Atrato-Tuyra Route*.—The tentative instrumental lines from the east and the west coasts, which were run in the examination of this supposed route, established the fact that Hellert, La Charme and Gogorza were pretenders—were it indeed necessary to establish this in the case of those who have done no more than make unsupported assertions. Our regular line of survey—by way of the Atrato and Paranchita rivers on the east, and the Tuyra and Cué rivers on the west—crossed the “divide” at an altitude of 712 feet; while a little further north, Captain Selfridge crossed at a height of 400 feet, as estimated from rough observations with his pocket aneroid.

M. de Gogorza claims that Captain Selfridge’s examinations did not cover his proposed route; but it will always be possible for him, and other authors of brilliant but vague projects, to make this complaint regarding any expedition not led by themselves. Whether the exact route proposed by M. Gogorza was followed in this case or not, it is certain that the explorations were sufficiently extensive to show that the whole country, on the Pacific side of the divide especially, is a net-work of high hills, which feature, taken in connection with the extensive swamps on the Atlantic side, is sufficient to condemn the route, independently of the height of the dividing ridge.*

*Since writing this paper, the pamphlet and map very recently published in Paris by M. de Gogorza have come into my possession. In this pamphlet—“Canal Interoceanique sans écluses ni Tunnels” (!)—M. Gogorza asserts that Commander Selfridge’s surveys support his own, so far as they were made over the same ground. This is an ERROR. Commander Selfridge gives the height of the mouth of the river Paya at one hundred and forty-four (144) feet, and the height of Paya village at two hundred and fifty (250) feet. M. Gogorza gives the same height for the mouth of the Paya, but is silent as to the heights in ascending to the village of Paya, twenty miles above, following the sinuosities of the stream, and does *not give the height of that village at all*. He contents himself with asserting that, at a distance of miles beyond the village, at the summit level, the height is

(This locality, with two preceding ones, involving also the region of a third, comprises points specially noted by M. Drouillet for examination; he thus entirely ignores the joint attempt by the English, the French and ourselves, on the latter route in 1854, and the recent instrumental disprovement of it, with the others, *by us*.)

9 and 10. *The Atrato-Napipi Route*.—This was examined first by parties under the direction of Commander Selfridge, and afterwards by Lieutenant Collins. By the last named officer a definite instrumental location for a canal was made; the question of additional water supply from the Cuia was investigated, and calculations for excavation and construction framed on a common basis, for like labor as for Nicaragua and Panama. The report of his survey, without maps and plans, is to be found in the appendix to the report of the Secretary of the Navy for 1875. The lack of appropriation for publishing this report, and that made by Commander Lull on Panama, *in full*, is regretted.

These surveys are not named by M. Drouillet in his list of authorities.

These repeated and laborious surveys certainly indicate the continued interest which the United States has taken in the construction of a canal. This interest dates back, indeed, to the administration of Mr. Jefferson, and its appreciation by the Congress of the United States was shown as early as 1835, by an elaborate report in the House of Representatives; as subsequently by various official inquiries and American treaties. (See Report No. 145, Ho. Rep., 30th Congress, 2d session *et al.*)

If necessary, not a few other American authorities might be cited, such as those of Trautwine, Kennish, Porter, Totten, and Childs, employed by private American enterprise, as affording reliable information within the limits claimed; but it would appear that the sufficiency of the data is already manifest, provided the authenticity is unquestioned; and this brings me to the second postulate of M. Drouillet, that "the data at hand are flagrantly contradictory."

But here I repeat that our surveys have been pursued for several years by officers of well established reputation and ability, aided by only fifty-eight metres (58), one hundred and ninety feet; that is to say, *sixty feet below the village!*

The altitude of the mouth of the Paya river itself, as given by himself, and on better authority, contradicts flatly his assertion that a ship-canal, without locks or tunnels, can be located between the summit level, the village of Paya, and the mouth of the Paya river. He terminates his canal at the Isla de Lagartos, but does not locate that significant island.

full and competent scientific staffs, with every advantage of outfit, of instruments and stores ; and, in the latter surveys, with the additional advantage of the experience possessed by the principal officers—an experience to be acquired only in the field.

The scientific staff of the first expedition of Commander Selfridge numbered thirty-five members, including astronomers, geologists, mineralogists, topographical and hydrographical engineers, telegraphers, photographers, and others. The men attached to this expedition, exclusive of natives employed as laborers, numbered about 300. Three ships of war were also attached to the survey—two on the Atlantic side and one on the Pacific side.

The scientific staff of the second expedition of Commander Selfridge numbered thirty (30) members, exclusive of the officers of the U. S. S. Nipsic and Resaca, both of which, with the U. S. S. Guard, were attached to the expedition.

The Tehuantepec and Nicaragua expeditions were equipped with like liberality.

Able officers of the United States coast survey and civil engineers were associated with the commanding officers in these various expeditions, notably Messrs. Sullivan, Mosman, Ogden, Merinden, and Blake, all of them distinguished coast survey officers, trained in the severely correct methods of that service, were with Commander Selfridge ; A. G. Menocal, civil engineer, U. S. N., was with Commander Lull ; and A. M. Fuertes, civil engineer, with Captain Shufeldt. Commander Lull and Lieutenant Collins had served with Commander Selfridge in the earlier expeditions in Darien, and many of the officers subsequently associated with them had also seen service in the same way.

The work assigned to the expeditions thus equipped was laid out by careful and ample instructions from the navy department, and was satisfactorily performed ; the results obtained are believed to be all that the nature of the conditions rendered possible.

None of these extended surveys conflict in any degree with each other or with other partial surveys or reconnoissances which have been at times undertaken by private American enterprise. If any authentic instrumental or proper tentative lines in the possession of M. Drouillet disprove or contradict any one of our surveys, this would certainly be of profound interest to the learned societies of the world, and afford for them foundation for further projects of exploration, however little they are considered necessary by those who have gone through these repeated practical labors and experiences in the

gloomy fastnesses of the great American isthmus. Until, however, such *authentic* contradictory data can be shown, it must appear that the "flagrant contradictions" asserted to exist, arise from a want of placing merited confidence in the surveys of the United States. If the unsupported statements of men who discover the proper site for an interoceanic canal by "observing the flight of low-flying Pisisi ducks," or who obtain their altitudes "by the velocity of mountain streams," or the boiling point of water merely; or who are confident of a continuous depression from the mere aspect of the forests, as seen from on board ship, or from having observed an "inclination of the ground to be scarcely perceptible;" if these deceptive appearances, so well recognized by travelers, some of which were strongly noted in this very connection by Humboldt when describing his ascent from Callao, are to be placed alongside of official government surveys, then certainly "the flagrant contradictions" must be expected, and will certainly exist, if even the new, general and "*serious*" survey now claimed to be necessary is undertaken and completed.

The deceptive appearance of the mountain ranges from the sea, which has misled so many, was thus noted by Lieutenant Michler, U. S. A., in his report of 1856-57: "In looking back from the ocean upon the country through which the travelers had recently passed, the depression in the Cordilleras becomes plainly visible. It seems to lose its mountainous character entirely. * * * One can easily, therefore, conceive why a preference should have been shown to this section by those interested in the construction of a canal." And the common experience of our officers on the isthmus has been, that wherever a line of low elevation has been affirmed to exist on the strength of the authority of "old Spanish maps or documents," or on the information of "intelligent persons residing in the vicinity," or "through conversations with the natives"—*there* an elevated, forbidding range of mountains or hills has been found.

Our surveys have been undertaken and conducted with a view to ascertain the relative practicability of all possible canal routes. It is not affirmed that they are sufficiently extensive and minute at all points to afford the engineer full data for locating a canal, and for estimating its approximate cost. Actual instrumental locations of determinate lines throughout were made at three points only—at Nicaragua, Panama, and the Napipi. The tentative lines in other places were carried only sufficiently far to demonstrate the impracticability or manifest relative inferiority; thus eliminating, however, all such territory from the canal problem.

If it is in the plan of M. Drouillet, or of others, to procure the precise data called for by the engineer on each of the pretended, or of the real lines of promise for a canal, there will certainly be need by such parties of the most extensive co-operation in every particular which is invited in the publication referred to.

The natural conditions of the American isthmus will be found widely different from those of Suez, to which constant reference is made. One is a region of extraordinary rainfall—the other of extreme dryness; the one covered with impenetrable and interminable forests—the other wholly denuded; the one a region of steep escarpments and water-sheds, where every ravine, many times during the year, becomes a river of rapid waters, rushing wildly to the sea, and bearing huge masses of silt, giant boulders and fallen trees—the other simply a sandy, level plain. If the existence of any narrow American valley, many miles in length, between the seas, *be* admitted, and a canal without locks be supposed to be located therein, *it must become the ultimate drainage of that whole tropical valley.* By what human power could it be kept clear of the debris swept into it by every heavy rainfall along its entire length?

Let such low valleys, however, continue to be pointed out “for a canal without lock or tunnel,” as by M. De Puydt, M. Gogorza, or by whomsoever can hold forth the most brilliant promise; let further search ~~be~~ made by whomsoever feels interested, hopeful and credulous; and let the work go on, aided by such forces, governmental or otherwise, as may be furnished; the United States and its learned societies may properly decline co-operation. The question whether the authorities I have quoted are sufficient to determine the location of a transcontinental ship-canal is an open one; those who think the authority insufficient, may well proceed with whatever surveys they may deem necessary.

In submitting what has been done by learned societies, no indulgence for nationality is desired; nor, on the other hand, can there be a tenable assumption that we are incapable of obtaining results which can be obtained by others, or that we have not the integrity to present them fairly. Surveys tell their own story, and discredit themselves if they are to be discredited. I feel sure that this learned body would not willingly discourage others in the prosecution of further surveys, however unnecessary the society may consider them, and however unwilling, therefore, itself to participate in them.

In Paris, in August, 1875, it was urged by persons who may, perhaps, be properly styled adventurers, attending the International

Geographical Congress, that the government of the United States had really shown no interest in the subject of a transcontinental American canal, and that our information and surveys amounted to but little. The misapprehension on the first of these points, if it exists, is too apparent to require contradiction; the assumption of the second seems the result of not having examined what the United States have done, or it is the affectation of a belief that we cannot do the work as well as any other people.

So far from the United States being indifferent to the construction of an interoceanic canal, for more than fifty years,* as has been shown, we have endeavored to establish the practicability of the work at the most favorable point; and I venture nothing in asserting that our government will be anxious to do whatever is proper to aid in the construction of the work on the broadest principles of common benefit to all nations and peoples.

It is asserted that Great Britain would oppose it, under the supposition of its injury to the Suez canal, in which she has now a pecuniary interest. But when by reference to the map it is seen how readily an American ship canal will bring her into communication with the eastern coast of Australia and New Zealand, relieving her outward-bound voyagers of head winds, it is safe to assert that such advantage, with others, would exceed in value yearly her whole interest in the Suez canal.

The American transcontinental canal will bring Great Britain within easy commercial relations with the entire west coast of America, exchanging the stormy passage around Cape Horn, with head winds, for a short American route with fair winds and good weather; it will make the products of British Columbia and of Central America (where British trade is even now so important) doubly valuable; and it will bring the wheat products of California more fully and competitively into British markets—thus cheapening and making less fluctuating the price of bread-stuffs, an incalculable advantage for the masses of a manufacturing and commercial country.

And while this is true, it is equally demonstrable, by an inspection of the world map, that the great lines of commercial intercourse and of civilization are distinct, and therefore do not invite any prejudicial rivalry between the two ship canals of the Eastern and the Western isthmuses. The Suez canal is the opened gate for the in-

*See correspondence between Mr. Clay and our chargé, Mr. Williams, and Mr. Canaza, Minister of the Centre, in April, 1825.

land sea route of Europe and North Africa, with southern Asia and its archipelago ; the American Isthmus canal invites Europe with our own commerce to the whole west coast of the Americas, to northern China and Japan, and southwardly to the Australian continent. Nor can commerce longer forget that not only the drainage of the rivers emptying into the American Mediterranean is of an area greater than that of all the rivers emptying from Europe into the Atlantic, and of all those emptying into the Mediterranean and into the Indian ocean, but that the valleys of these American rivers are those of different productive zones. The back country essential to commerce exists here, therefore (as Maury showed twenty-five years ago), around the Mexican gulf and the Caribbean sea, to a larger extent than that around any other sea.

It is said that the overland railroad interests will oppose the construction of a transcontinental ship-canal. This will certainly not be the case if they study their own advantage.

This year the wheat crop of California for export alone is stated to be in excess of twenty millions (20,000,000) of sacks of 100 pounds each, *none of which can be sent to the eastern coast by railroad without a commercial loss.*

The undoubted advantage to a railroad is to favor the most economic means of transport of this great product, and of other gross and valuable products not transported by rail. For by thus promoting their increase (needed for the supply of Europe and of our own eastern coast) the railroad must surely gain a recompense through the travel consequent upon an increased and healthy population on the Pacific coast, and the transportation of the light and valuable freights that would of necessity then exist to meet their wants. It requires but small comprehension of the situation to appreciate the fact that the construction of a transcontinental canal would build up instead of injuring railroad interests between the two oceans.

By our geographical position and relative proximity to the isthmus and the countries beyond, we have a greater interest than any European Power in the construction of this great work. The commerce of the whole world, however, has large interest in it, and, therefore, the cost of its construction and its profits, as well as other consequent advantages, seem common to all. This necessarily involves a broad neutrality for the canal and its approaches—a neutrality to be supported either passively or actively, as the nations may best exert their forces.

The correction of misconceptions on this whole subject, and the apparent advantage of stating, at this time, definitely its true condition, has been the object of this paper. In common with many others, I have looked for many years with much interest to the development of this problem in a commercial view, which, in fact, involves its realization. No doubt exists now of this commercial practicability. I may add, as a personal conviction, that however long and seriously the search may be continued for "results" by surveys, nothing can be or will be developed so advantageous as that which the surveys of our government present for your consideration.

I am very respectfully yours,

DANIEL AMMEN,

Commodore U. S. Navy and Chief of Bureau of Navigation.

Col. T. Bailey Myers, at the conclusion of the reading, said:

"This subject having been again brought up by French geographers, and attention having been called to the work which has been done by officers of our own navy, under the direction of the government, on the various routes examined in searching for the most feasible for an isthmus canal, Commodore Ammen, as chief of the bureau charged with this duty, possessed of the official statistics, has given us a brief but full statement of these valuable preliminary explorations, made by selected and competent officers, leaving as to those routes, no grounds for conjecture, but reducing their work to intelligible charts, supported by such corroborative evidences of accuracy as were considered valuable to those who undertake the enterprise, fairly open to the examination and suggestions of other engineers, based upon some, if not similar facilities of observation, and also to the competition of more practicable routes, if possible, discovered by other nations or our own.

I move that the thanks of this Society be tendered Commodore Ammen for the paper he has so kindly prepared, and that it be printed in the Journal of the Society."

The motion was carried unanimously.